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This volume is dedicated to Dr. Rainer Zangerl

New *Archaeoscyphia* (Porifera) from the Ordovician of Anticosti Island, Quebec

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ABSTRACT

A new branched sponge, *Archaeoscyphia boltoni*, is described from the lower Ellis Bay Formation in Anticosti Island, Quebec. The position of the species and genus within the family Anthaspidellidae is briefly discussed.

INTRODUCTION

Until recently the principal stratigraphic and paleontologic work on Anticosti Island was that of Twenhofel (1928). He (1928, p. 103) described specimens of *Hindia* cf. *fibrosa* (Roemer) from the Ellis Bay and earlier Ordovician formations from Anticosti Island. These are the only previously reported sponges from the Ellis Bay sequence on the island. *Rauffella* cf. *filosa* Ulrich was reported as a sponge from Ellis Bay rocks by Twenhofel (1928, p. 104) but this form is now considered to be a trace fossil, probably a burrow-filling, and not a sponge.

More recent stratigraphic and paleontologic studies by Bolton (1961, 1965, 1970a, b, 1972) and others have added detail to earlier ıvestigations. In addition, Bolton collected a new sponge as part of xtensive systematic paleontologic studies on the island. This paper ; a description of the sponge specimens he collected from the Salmon

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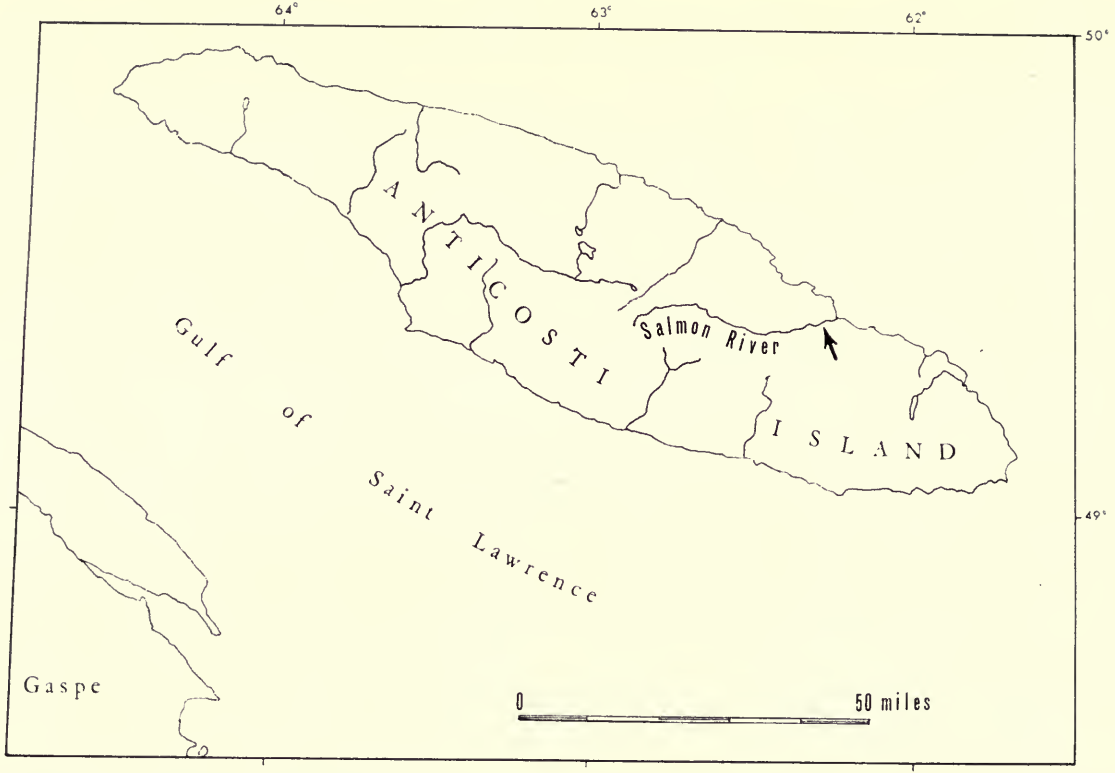

FIG. 1. Index map showing sponge locality along the Salmon River where *Archaeoscyphia boltoni* n. sp. has been collected, along the south bank, 12,000–14,215 ft. from the river mouth.

River area in the northeastern part of the island. He kindly loaned us the specimens for study.

SYSTEMATIC DESCRIPTION

Archaeoscyphia boltoni new species. Figures 2–6.

Diagnosis.—Weakly annulated to tuberose, branched, archaeoscyphiaid sponge in which the complex rods of the skeletal system flare upward and outward away from a zone of pinnation which is at or near the spongocoel surface. Spicule structure somewhat more complex than most anthaspidellids, with moderately irregular complex rods and with irregularity in spicule orientation and placement.

Description.—The sponge is a moderately thick-walled branching form, with a simple open spongocoel. The holotype is approximately 19 cm. high and with two branches, the major one approximately 8 cm. long and tapering from a maximum diameter of nearly 7 cm. to 6 cm. at the upper broken end. The smaller branch is only 3 cm. long and 4.5 cm. in diameter. Four additional fragmentary specimens are available.

Spongocoel in the top of the larger branch of the holotype is 35 mm. in diameter and distinctly circular and is continuous through the sponge. In the lower part of the branch it is ovoid. The spongocoel in the smaller branch is approximately 18 mm. in diameter. Sponge walls in the larger branch are 14–25 mm. thick at a maximum and are 11 to 15 mm. thick in the smaller branch.

The exterior of the sponge is weakly annular to tuberose, with irregular subhorizontal ridges up to 15 mm. high rising above the generally tubular branch. Weak annuli are spaced 3–5 cm. apart and are most pronounced on the larger branch, although also evident on the lower part of the sponge. They are even more pronounced on the fragmentary specimens.

Two distinct sizes of canals are apparent in both vertical and horizontal sections. The larger of these are subhorizontal, radially arranged, to slightly curved. They occasionally bifurcate at about mid-wall thickness, producing two canals of about the same diameter as the single continuation. In vertical sections canals are seen to bificurate both toward the spongocoel and toward the exterior. Most canals appear cylindrical with relatively uniform diameters throughout their total extent through the wall. There are minor variations and constrictions that amount to about one-fifth the canal diameter.

FIG. 2. Holotype of *Archaeoscyphia boltoni* n. sp. as seen from the side. GSC 32371, approximately × 0.62.

The canals occur in vertical rows, spaced 5 to 6 openings per centimeter in a row and with 5 or 6 rows per centimeter, as measured in the transverse or horizontal section, around the dermal and gastral surface. Spacing is maintained approximately equally in the radiating pattern by both bifurcation and insertion of new canals.

FIG. 3. *Archaeoscyphia boltoni* n. sp. showing the spongocoel surface and a section through the wall. Curved canals pierce the wall and occur in stacked vertical series as shown by the aligned openings in the spongocoel wall. GSC 32372, × 1.

Although most of the larger canals are moderately straight, there is a general tendency for them to gently bend downward toward the gastral surface. This is most obvious in the fragmentary paratypes.

The smaller canals are parallel to the complex skeletal rods. In vertical section they are long linear features that are one of the distinctive characteristics of the sponge. They are somewhat irregular along their length and are outlined by sub-parallel skeletal rods. In vertical section they appear to be 0.25–0.35 mm. across and show constrictions about one-quarter the width of the canal. In the horizontal section these smaller canals are much less well defined, although they appear as somewhat irregularly placed openings, now mainly matrix-filled. They appear to be moderately uniformly spaced from 0.2–0.4 mm. apart, separated by one or more skeletal complexes. They range in outline from distinctly elliptical or nearly circular to triangular where they rise between spokes of the skeletal structure. The spacing is decidedly less regular than the simple canals in most genera of the Anthaspidellidae.

Dominant elements of the skeletal structure are trabs, small complex rods produced by raytip union of spicules. The trabs are arranged nearly parallel to one another in an upward flaring position, branching from a general surface of pinnation near the spongocoel wall. Outer trabs swing away from nearly parallel to the spongocoel

FIG. 4. Transverse cross-section through upper part of holotype of *Archaeoscyphia boltoni* showing canal and skeletal development. Radial canals are mainly light colored where filled with crystalline calcite, or dark gray where matrix-filled. Circular spongocoel is filled with bioclastic debris. GSC 32371, × 2.5.

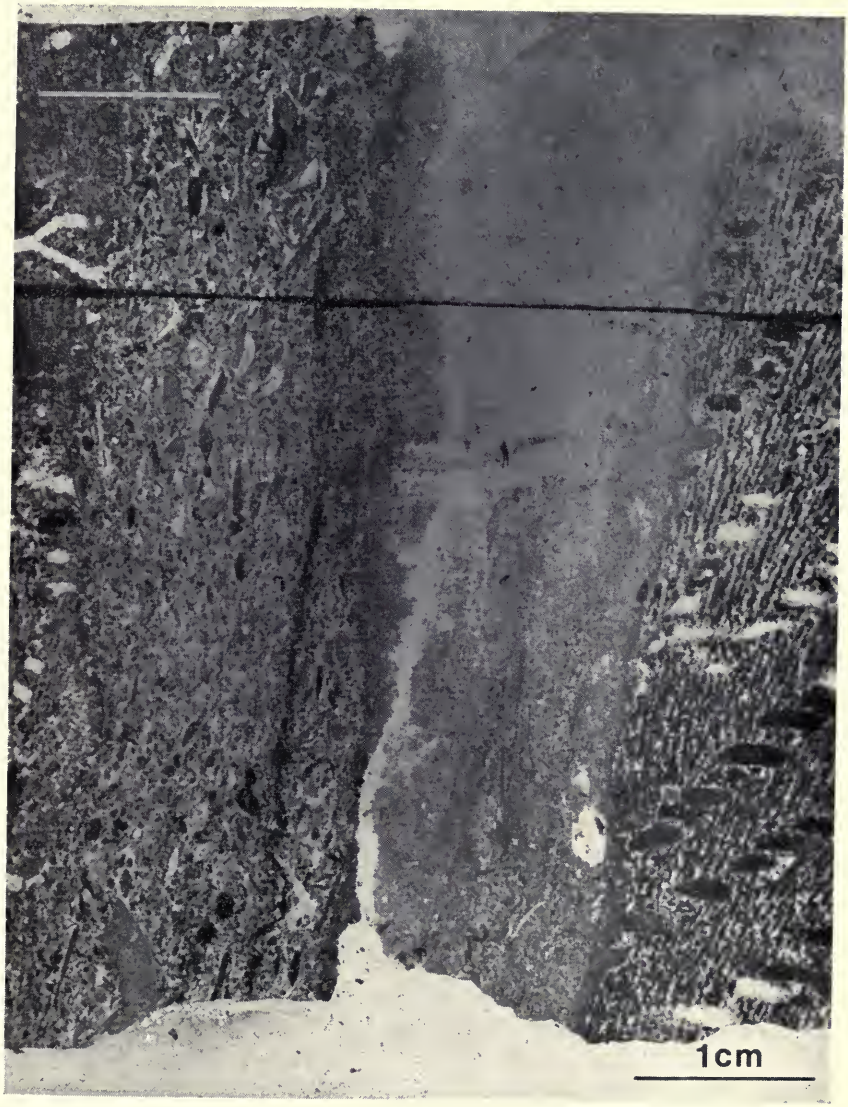

FIG. 5. Nearly vertical section through upper part of one branch of holotype of *Archaeoscyphia boltoni* showing spongocoel filled with bioclastic material and thick walls pierced by radiating stacked canals. Light rays along the right are somewhat irregular trabs. GSC 32371, × 2.4.

wall in the lower part to approximately 45 degrees from the gastral surface at their upper terminations. Individual trabs are quite variable in cross-section, ranging from strongly triangular to circular to star-shaped. Thickness or diameter of the trabs range from 0.12–

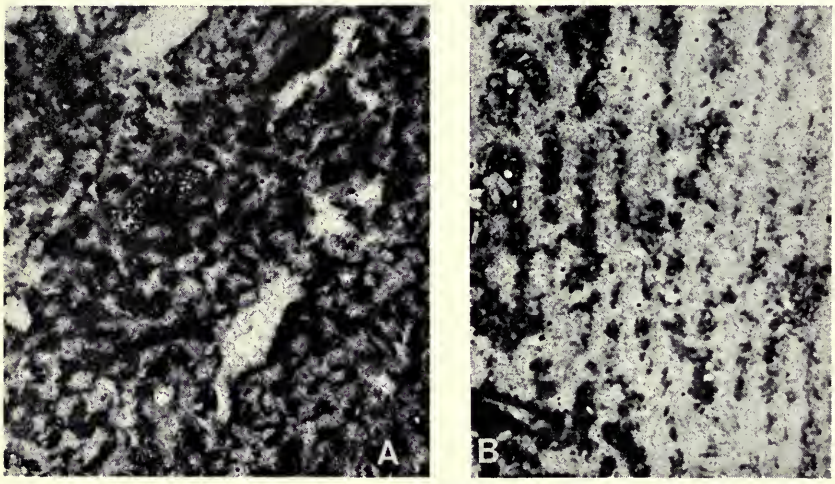

FIG. 6. Photomicrographs of skeletal structure of *Archaeoscyphia boltoni* n. sp., holotype. **A.** Transverse section showing irregular outline of trabs (light gray) connected by spicule axes. GSC 32371, × 10. **B.** Vertical section showing subparallel trabs connected by spicule axes, particularly on the left. GSC 32371, × 10.

0.40 mm., with considerable variation along individual rods dependent upon the nature of spicule articulation. Most of the trabs are now composed of granular crystalline calcite with details preserved only along some rod margins where darker matrix outlines the spicular elements.

Individual spicules are obscured in the generally calcareous preservation. Some dendroclones are preserved in part of the specimen and seem to have the general orientation and structural pattern of the Anthaspidellidae, particularly like the somewhat confused structure of *Archaeoscyphia*. Shafts of spicules are 0.24–0.28 mm. long and have a diameter of 0.03–0.04 mm. where thinnest. The shafts branch into two clads of 0.12–0.14 mm. long and 0.03–0.04 mm. in diameter. The fine articulation between spicules is lost in the granular preservation. In only a few areas are spicules preserved in enough detail that individual elements can be recognized.

Discussion.—The branching form of this species differentiates it from most early Paleozoic sponges. *Lissocoelia* Bassler (1941), a branching sponge from Nevada, is considerably smaller and has a much finer textured skeletal net. *Ozarkocoelia* Cullison, 1944, is also branching but its spicular character is different. The skeletal structure of *Archaeoscyphia minganensis* (Billings, 1859) and of *A. annulata* Cullison, 1944, is similar but both are unbranched and in addition are regularly and distinctly annulate in contrast to the irregular pattern of *A. boltoni* n. sp.

The irregular skeletal structure of *Archaeoscyphia boltoni* n. sp. is somewhat reminiscent of that in other genera currently included in the Anthaspidellidae such as *Allosaccus* Raymond and Okulitch, 1940, *Lissocoelia* Bassler, (1927, 1941), and *Streptosolen* Ulrich and Everett, 1889. It contrasts strongly with the much more regular and consistent structure typified by such genera as *Nevadocoelia* Bassler (1927, 1941), *Calycocoelia* Bassler, (1927, 1941), *Aulocopina* Billings, 1874, *Aulocopium*, and *Phacellopegma* Gerth, 1927. Review of the Anthaspidellidae currently underway by the senior author suggests that the family should be subdivided, based upon this difference in skeletal development.

Material, stratigraphic position, and locality.—Holotype and four incomplete specimens at Geological Survey of Canada, Ottawa, Ontario. Member 2, *Hesperorthis laurentia* zone (Bolton, 1971), of the Ellis Bay Formation. Salmon River. South Bank. Anticosti Island, Quebec.

Holotype: GSC 32371, 12,300 ft. upstream from mouth of river; specimens GSC 32372—32374, 12,000–14,215 ft. upstream from mouth of river.

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